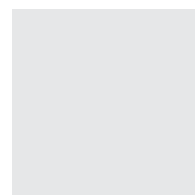
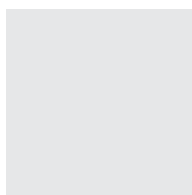




Improving Healthcare Through AHRQ's Digital Healthcare Research Program

2021 Year in Review



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2021 Year in Review

Prepared for:

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September 2022

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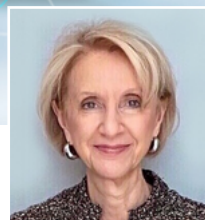
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Chris Dymek, Ed.D.

*Director, Digital Healthcare
Research Division*

Executive Summary

A message from the Director of the Digital Healthcare Research Program

AHRQ's Digital Healthcare Research (DHR) program has played a central role in the emerging era of digital healthcare transformation. The program funds research that yields actionable findings about which digital technologies have the potential to improve patient care.

Our work is guided by a central commitment: to help build a research base on how digital healthcare solutions can be designed and implemented to improve patient safety, care, and shared decision making without putting excessive burdens on physicians and other members of the care team. We are excited to highlight the progress that our investments have made on behalf of the American public in the past year.

This year's report leads with our [Research Spotlight](#), Engaging Patients and Caregivers More Fully in Care Decisions and Actions, which focuses on how digital healthcare technology can better support patient-centered care. It explores AHRQ's ongoing research investments on engaging and empowering patients in their care decisions, and how these technologies support the data collection and integration of patient-reported data to improve shared decision making by patients and clinicians.

The report also summarizes the [impact](#) that AHRQ-funded research has had in the following key stakeholder themes:

- Engaging and Empowering Patients
- Optimizing Care Delivery for Clinicians
- Supporting Health Systems in Advancing Care Delivery

"The Digital Healthcare Research Program funds research to create actionable findings around 'what and how digital healthcare technologies work best' for its key stakeholders: patients, clinicians, and health systems working to improve healthcare quality and safety."

Included are stories of completed and emerging research by each research theme. Completed research stories amplify and demonstrate the impact of AHRQ-funded projects. Emerging research stories highlight new and innovative projects that address important AHRQ priority areas, such as advancing health equity or improving care during patient transitions. The 18 stories showcased in this report are told in the Principal Investigator's own words, and demonstrate how AHRQ-funded researchers are advancing the knowledge base of how digital technologies can improve care, such as supporting chronic disease management including attention deficit and hyperactivity disorder and depression; how optimizing data visualization can improve care; and improving healthcare technology design to advance patient safety.

The [dissemination](#) of AHRQ-funded research findings is critical to knowledge transfer and the spread of impactful evidence-based strategies. This report will present information about dissemination efforts including national webinars, research presentations, and publications. This year alone, presentations at large national and international conferences allowed researchers to discuss the impact of their work with thousands of attendees, and over 100 published research articles disseminate their research results even further.

In 2021,
the DHR program supported:

104 Grants and Nine
Research Contracts

64 Institutions in
23 States and the
District of Columbia

For a total 2021 investment of:

\$30 Million including:

- \$14.4 million in funding from DHR appropriation;
- \$11 million in funding from the Patient-Centered Outcomes Research Trust Fund; and
- \$4.6 million in funding from General Health Services Research appropriation.

For a total investment of \$158 million across all project years.

We are pleased to share the findings and real-world applications of the DHR program's investments. We continue to champion advances within the field while taking important steps to increase our understanding of digital technologies that lead to better patient care. We hope that you enjoy reading about many of the DHR program accomplishments and the significant impact of the health services research we fund. Please send any comments or questions to DigitalHealthcareResearch@ahrq.hhs.gov.

Research Spotlight

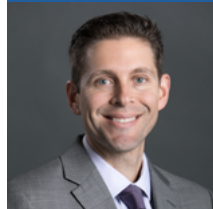
Engaging Patients and Caregivers More Fully in Care Decisions and Actions

These are the voices of Principal Investigators leading AHRQ-funded studies to engage patients and caregivers more fully in care decisions and actions. They are researchers who understand how improved conversations can result in better care. They want to help clinicians tap into that rich trove of information—what patients want from treatment, what they and their caregivers can and will do to manage their health. And they want clinicians to be able to send patients home with tools to help.

AHRQ's Digital Healthcare Research (DHR) program recently funded 24 research projects to explore ways in which clinicians might use technology to engage patients and caregivers in shared decision making and in treatment.

These studies span patient populations, care settings, and critical moments in care. Examples include [children with ADHD](#) and their parents and teachers, patients/caregivers navigating [hospital discharge](#), patients with [multiple chronic conditions](#), [elders over 75](#) and their care networks, and many others.

“How can we get the right information in the hands of care team members and patients so they can have what are often very difficult conversations and pick out the right treatments?”



Christopher A. Harle, Ph.D.

Professor of Health Outcomes and Biomedical Informatics & Chief Research Information Officer – University of Florida

“There’s a real gap in terms of how do we better support treatment in between clinic visits, and in a way that people can actually—on a day-to-day basis—implement.”



Kimberley D. Lakes, Ph.D.

Professor of Clinical Psychiatry and Neuroscience – University of California, Riverside

“I could see the potential of [technology] for patients to use for self-management and for us to collaborate, physicians and patients and nurses, on ways to make care better.”



**Valerie Press, M.D., M.P.H.,
FACP, FAAP, SFHM, ATSF**

Associate Professor of Medicine and Pediatrics & Executive Medical Director of Specialty Value-Based Care – University of Chicago

All AHRQ-funded studies put patients and caregivers at the heart of the research. Their findings offer valuable insights for clinicians, payers, vendors, patient advocates, and others with a stake in healthcare and health technologies.

Technology and Data for Better Conversations

The common elements connecting these studies are the patient's health data—whether collected via commercial wearables, patient portals, or clinical tools. Once captured, these data must survive multiple hand-offs—from patient or caregiver to clinician, and between members of their care team. Each hand-off represents a chance for a conversation. Each hand-off represents an opportunity to activate the patient/caregiver, establish trust, and inform care decisions. Each hand-off also represents a human and technological challenge. These hand-offs also represent a chance to augment clinical data to aid in diagnostics and care.

The continued rise of digital healthcare apps and wearables means these handoffs are increasingly likely and the dataset is more complete. As many as [one in five](#) Americans use consumer technology to track health behaviors and metrics, including diet, exercise, heart rate, temperature, sleep, and more. Though encouraging, this adoption is not universal, with fewer than 44 percent of adults 65 and older [tracking health measures at all](#).

Clinical tools that collect patient-reported outcomes (PROs) have also gained traction with patients, who [reported](#) high satisfaction with ease of use and felt increased reassurance around their care. Patients felt more supported, while simultaneously providing more information to clinicians to guide their care.

Patients, healthcare systems, and payers benefit when clinicians gain insight into the patient's condition—ideally from the patient's device of choice. Encouragingly, most electronic health record (EHR) systems [allow direct intake](#) of patient-generated data, but human and process barriers remain.

For example, [a study of patients with hypertension](#) found that while many measured their blood pressure at home, only half of those patients actually shared the data with their physician. When they did, 88 percent of their physicians manually entered the numbers in the patient's record as unstructured, narrative data.

Why does this matter? Information buried in clinical notes is far less useful because it cannot be aggregated or graphed over time. This represents a major missed opportunity: data visualizations can support shared decision making, helping patients/caregivers and clinicians [spot values outside of a target range](#) and [balance speed and accuracy](#) when reviewing the information. Data visualizations may also improve care and outcomes by helping patients and caregivers [manage chronic conditions](#) and reduce [drug interactions](#).

Evidence-Based Guidance and Tools for Clinicians

Actionable results are available in two comprehensive resources designed to help healthcare systems and clinics integrate patient-generated health data into practice. One is a [practical guide](#) for ambulatory care practices, offering insights drawn from the literature and best practices shared by the community. The guide aims to help clinics address issues such as staff and patient readiness, technology security, billing, and reimbursement. The other is a first-of-its-kind [web-based toolkit](#) to help health information technology (IT) stakeholders design, integrate, and evaluate technologies for capturing PROs.

Since publication, these resources have been accessed more than 8,200 times, a clear indication of the growing interest in patient-generated health data. The demand for these resources also signals the potential opportunity for these technologies to help engage patients and caregivers in decisions and care—if they are designed with this goal in mind.

The Need for Continued Funding

Clearly, digital healthcare technologies have tremendous potential to activate patients and caregivers. They make it easier to share insights, inform decisions, energize conversations in the clinic, and even support treatment.

As good research always does, our efforts also uncovered questions to tackle with future funding. For example, [an environmental scan](#) found a need for research to explicitly connect use of digital healthcare technologies to improved outcomes. Future research must also further examine how technology use affects health inequities. Some guidance exists to help clinics build health equity into digital programs, but much work remains to formalize best practices related to access, digital health literacy, translation, and accessible design.

Still, these AHRQ-funded studies accomplished a great deal to advance technology use in service of patient and caregiver engagement. With these evidence-based insights, vendors can improve clinical platforms and patient apps; healthcare systems and clinicians can make informed technology choices; and patients, caregivers, and patient advocates can evaluate clinicians based on those choices.

As we pursue advancements in healthcare safety and quality for all Americans, AHRQ will continue to champion the promise of digital healthcare technology to engage patients and caregivers in care and treatment—one patient-centered study at a time.



Research Overview

Overview

Digital healthcare knowledge and tools can enhance the efforts of patients, clinicians, and health systems working to improve healthcare quality and safety. AHRQ's DHR program funds research to create actionable findings on what and how digital healthcare works best for these critical stakeholders in healthcare.

Now more than ever, the DHR program is focused on supporting crucial research that identifies how the various components of the ever evolving digital healthcare ecosystem can best come together to positively influence healthcare delivery and create value for its key stakeholders: patients, clinicians, and health systems. This ecosystem includes clinical, contextual, and patient-generated health data as well as the tools used to manage and apply these data, such as advanced analytics and data visualizations. The application of these data can result in new knowledge, which can take the form of computable clinical guidelines and decision support. The DHR program continues to fund research on how these ecosystem elements and the actors who create and use them can best support the quality and safety of healthcare.

Research Themes

In 2021, the DHR program supported 104 grants and nine research contracts across the three main stakeholder themes:



Engaging and
Empowering Patients



Optimizing Care
Delivery for Clinicians



Supporting Health Systems
in Advancing Care Delivery

The DHR program funds research to identify and generate knowledge and tools on how digital healthcare solutions can be designed and implemented to improve patient safety, care, and shared decision making without placing excessive burden on users, including patients, physicians, and other members of care teams.

Research in this summary is broken down by completed research and newly funded (i.e., emerging) research.

- Completed research: 21 grants and contracts recently completed
- Emerging research: 25 grants and contracts recently awarded

Within each stakeholder theme, we share significant findings and impact to the field for completed research and for emerging research, we share its potential significance.



Engaging and Empowering Patients

Engaging and empowering patients in their own healthcare leads to improvements in safety, quality, and satisfaction of care. Digital healthcare tools can facilitate patient engagement through the use of patient portals, smartphones, and tracking vitals or symptoms with wearable technology or mobile apps. Digital healthcare tools also empower patients to participate more actively in their own health self-management, chronic care management, and wellness at various points of interaction with the healthcare system, including during care transitions when patients may be especially vulnerable.

In 2021, several DHR-funded research projects focused on patients, including studying how digital healthcare tools can: empower patients and their families to improve patient-centered care; support chronic disease management; and improve care transitions.



Below are research stories told in the investigator's own words that focus on **engaging and empowering patients**.



Engaging and Empowering Patients

Empowering patients and caregivers to improve patient-centered care

[The Clinical Decision Support Innovation Collaborative: Including the Patient's Voice in Care](#)

EMERGING

[Identifying Patients With High Need During Care Transitions to Improve Care and Meet Social Needs](#)

EMERGING

Improving care during patient transitions

[Breathing Easy: Virtual Medication Education for Patients With Chronic Obstructive Pulmonary Disease](#)

EMERGING

Using digital healthcare tools in chronic disease management

[Opening a Window to Depression](#)

COMPLETED

[Hanging Out With CoolCraig: Self-Regulation for Youth With Attention Deficit Hyperactivity Disorder](#)

COMPLETED

Learn about [other research](#) related to this theme.



The Clinical Decision Support Innovation Collaborative: Including the Patient's Voice in Care

The Clinical Decision Support Innovation Collaborative will integrate perspectives from diverse stakeholders, including patients and caregivers, clinicians, researchers, clinical decision support developers, informaticians, payers, and policymakers to produce resources and evidence to make clinical decision support more valuable and meaningful to patients, clinicians, and healthcare systems.

The patient's voice in care

Recognizing that patients are the best source of information about their needs and preferences, patient-centered outcomes research (PCOR) evaluates questions and results from the lens of what is important to both patients and caregivers. Despite agreement among the medical community, researchers, and other stakeholders that PCOR has the potential to empower patients and improve outcomes, translating PCOR findings into clinical practice is challenging. Informing clinical decision support (CDS) with PCOR findings using both patient-centered and patient-specific information that aligns with patient needs, preferences, and values can help close this gap.

A collaborative to support uptake of PCOR-informed CDS

With AHRQ support, Dr. Prashila Dullabh and a team at the National Opinion Research Center at the University of Chicago and several partners have formed the Clinical Decision Support Innovation Collaborative (CDSiC) to advance the design, development, dissemination, implementation, use, measurement, and evaluation of evidence-based, interoperable, and publicly available patient-centered CDS. The collaborative will integrate perspectives from diverse stakeholders, including patients and caregivers, clinicians, researchers, CDS developers, informaticians, payers, and policymakers to produce resources and evidence to advance patient-centered CDS. It will feature an innovation center and a research and development hub to facilitate real-world CDS measurement and testing.



PRINCIPAL INVESTIGATOR



Prashila Dullabh,
M.D.



ORGANIZATION

National Opinion
Research Center at the
University of Chicago



RESEARCH PROFILE

[Clinical Decision Support
Innovation Collaborative
\(CDSiC\)](#)



FUNDED AMOUNT

\$14,478,819



RESEARCH TYPE

Emerging



“We can make better use of evidence through digital tools that allow patients and clinicians to take advantage of available evidence to improve the quality of care that’s delivered.”

Dr. Prashila Dullabh

Translating patient needs and preferences into care

This research has the potential to increase the use of PCOR evidence incorporation into patient-centered CDS that directly engages patients or caregivers via apps, patient portals, or in different settings, to improve the quality and safety of care. The CDSiC’s vision is for patients, caregivers, and clinicians to have the information to make evidence-informed decisions that improve the health and well-being of all individuals.



Identifying Patients With High Need During Care Transitions to Improve Care and Meet Social Needs

Using health information exchange to identify high-need patients during care transitions can facilitate cross-sector communication, improve care continuity, and reduce rehospitalizations and other acute care.

Using health information exchange to support transitions in care

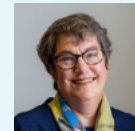
People with multiple complex chronic conditions, functional disabilities, and/or social needs often need highly coordinated, cross-sector care and support when discharged from the hospital. For example, individuals with housing insecurity may not only require followup care from medical and behavioral health providers but may also need access to social services at the time of discharge from the hospital. This fragmented continuum of care can add to treatment burden and jeopardize the safety of individuals who already have compromised health. In a previous AHRQ-funded study, Dr. Sharon Hewner and her team at the State University of New York at Buffalo developed and implemented the [coordinating transitions intervention \(CTI\)](#) that used health information exchange (HIE) data to alert primary care providers of high-risk patients' discharge from the hospital and provide rapid nurse outreach to assess social and behavioral determinants of health.

Identifying high-need and high-risk patients to support cross-sector care: enhanced CTI

While the research showed that CTI decreased rehospitalizations and emergency department (ED) visits, Dr. Hewner and her team saw a persistent gap in primary care followup, social needs assessment, and collaborative cross-sector care planning for post-discharge patients most in need of support and at risk of rehospitalization. In this followup research, the team is now expanding CTI to better pinpoint patients needing intensive care transition followup using algorithms and risk stratification and to engage social and behavioral health providers in managing them, including developing cross-sector comprehensive shared care plans.



PRINCIPAL INVESTIGATOR



Sharon Hewner, Ph.D.



ORGANIZATION

State University of New York at Buffalo



RESEARCH PROFILE

[Implementing Personalized Cross-Sector Transitional Care Management to Promote Care Continuity, Reduce Low-Value Utilization, and Reduce the Burden of Treatment for High-Need, High-Cost Patients](#)



FUNDED AMOUNT

\$1,950,923



RESEARCH TYPE

Emerging



The enhanced CTI will send providers real-time discharge alerts generated by a robust algorithm that identifies patients the most in need of cross-sector care. The personalized alert will trigger the creation of a comprehensive shared care plan curated by a professional care manager and shared with healthcare, behavioral health, and social service providers using HIE.

“It’s not just health problems, it’s people who also have behavioral health problems and probably various unmet social needs that we’re trying to figure out. How do we quickly give the right people the right information so they can take an immediate action to prevent someone from really running into problems once they are home?”

Dr. Sharon Hewner

Focusing on high-risk and high-need patients should improve continuity and reduce unnecessary care

The research team will study the effect of the enhanced CTI on the care coordination process, patient and provider burdens of care, and healthcare use. The hope is that expanding CTI will better support the identification of complex patients at the point of transition between care settings, enhance communication through a shareable comprehensive care plan, and facilitate referrals to care management, thereby improving continuity and reducing rehospitalization and other acute care visits.



Breathing Easy: Virtual Medication Education for Patients With Chronic Obstructive Pulmonary Disease

Virtual visits with members of a pharmacy team can support patients recently discharged from the hospital with their medication use and improve outcomes among chronic obstructive pulmonary disease patients at high risk for readmission.

Inhaling a better breath

Chronic obstructive pulmonary disease (COPD) is one of the most common chronic diseases among adults in the United States that often requires hospitalization and, far too frequently, rehospitalizations. Prescription medicines can help control COPD symptoms, but patients are often readmitted to the hospital due to medication misuse. Years of research by Dr. Valerie Press and her team at the University of Chicago showed that sometimes patients don't know the proper technique to get the medicine into their lungs. Ongoing medication education after a patient is released from the hospital could increase efficacy of medication use and reduce rehospitalizations.

Home-schooling for medication education

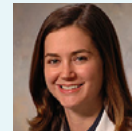
The team is developing a medication education intervention for patients with COPD who have recently been released from the hospital. This intervention, called the Telehealth Education Leveraging Electronic Transitions of Care for COPD Patients (TELE-TOC), will let patients talk virtually with pharmacists, in the comfort of their own homes, and discuss which medications to use and how to properly take them. Clinicians can record these visits in patient electronic records.

"I worry about individuals getting left behind, and so it's been a huge thread of my work in designing any technology-based intervention, trying to get under-resourced voices to the table."

Dr. Valerie Press



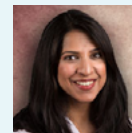
PRINCIPAL INVESTIGATORS



Valerie Press, M.D.,
M.P.H., FACP, FAAP,
SFHM, ATSF,



Joanna Abraham,
Ph.D.,



Vineet Arora, M.D.



ORGANIZATION

University of Chicago



RESEARCH PROFILE

[TELE-TOC: Telehealth Education Leveraging Electronic Transitions of Care for COPD Patients](#)



FUNDED AMOUNT

\$1,999,997



RESEARCH TYPE

Emerging



Reducing readmission

With stakeholder involvement and health equity at the core of the TELE-TOC development, Dr. Press and her team are building a tool that can be used for everyone in need of chronic lung disease self-management. The research team will include patient and clinician input every step of the way to ensure the user-centered design addresses the needs of all who would use and benefit from TELE-TOC. The technology has the potential to enhance proper medication use among the widely diverse patient population with COPD, while reducing hospital readmission.



Opening a Window to Depression

Many people with depression who do not have upcoming medical appointments go undiagnosed. An online questionnaire can help get them into treatment.

The hidden nature of depression

Depression rates are increasing in the United States and continue to be exacerbated by the COVID-19 pandemic. Even when systematic screening is in place, only about half of symptomatic patients are diagnosed, and even fewer are treated until a crisis occurs. Research shows higher ED admissions, urgent care visits, and hospitalization rates among people with depression.

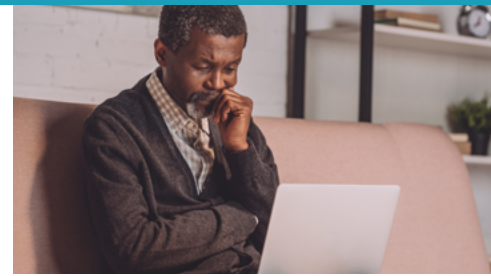
As Dr. Neda Laiteerapong points out, people who go to a behavioral health provider have already acknowledged that they need help, are willing to talk to someone about it, and are open to treatment. “The people who come to see me in my clinic are not those I’m usually worried about. I’m worried about the people who don’t show up when they are scheduled, who cancel appointments. Patients are really suffering at home.”

“Depression is comorbid with anxiety and trauma. If we ignore the depression, all the other stuff we’re doing to keep people well, like asking them to get cancer screenings, can be a waste of time. It’s really hard to convince someone to care about their future if they can’t even get out of bed.”

Dr. Neda Laiteerapong

A depression questionnaire via a patient portal to increase screening rates

Dr. Laiteerapong and her colleagues at the University of Chicago conducted a study to see if screening patients through a patient portal could identify more patients with depression symptoms and facilitate timely treatment compared with those screened for depression by medical assistants during clinic appointments.



PRINCIPAL INVESTIGATOR



Neda Laiteerapong,
M.D., M.S.



ORGANIZATION

University of Chicago



RESEARCH PROFILE

[Patient Outcomes Reporting for Timely Assessments of Life with Depression: PORTAL-Depression](#)



FUNDED AMOUNT

\$1,170,087



RESEARCH TYPE

Completed



Unlikely to initiate a visit, but willing to respond to an at-home assessment

The team found that people who received the assessment via the patient portal and filled it out at home had higher instances of depression than those who came to clinic for appointments. They also had more severe depression. They were the patients who had dropped off the radar and who providers were concerned about.

An electronic questionnaire can help identify people with depression symptoms, rather than waiting for them to seek care.

This study suggests that inviting patients who have depression symptoms to self-report via a portal can increase the reach and frequency of depression screening and monitoring. An electronic questionnaire can help identify people with depression symptoms, rather than waiting for them to seek care.



Hanging Out With CoolCraig: Self-Regulation for Youth With Attention Deficit Hyperactivity Disorder

A wearable digital healthcare intervention to promote self-regulation among children with attention deficit hyperactivity disorder and their parents is a promising method to support adherence to treatment.

Treatment support between clinic visits

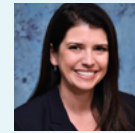
Attention deficit hyperactivity disorder (ADHD) is one of the most common psychiatric conditions among adolescents and requires treatment continuity to support lifelong gains. Traditionally, treatment for ADHD includes behavioral intervention and, often, daily medication. While effective, long-term adherence with this model can be challenging for both the child and the parent, related to limited support outside the clinical setting. Dr. Kimberley Lakes and Dr. Gillian Hayes, a psychologist and computer scientist, respectively, paired their expertise to design technology that would address this gap in care by maintaining treatment for youth with ADHD outside of visits to the doctor's office.

A solution on your wrist

The research team developed and piloted CoolCraig, a system consisting of a smartwatch, mobile phone application, and web portal to deliver self-regulating interventions to both the youth wearing the device and their parents. Dr. Lakes and Dr. Hayes and their team designed the technology with the input of users, hosting design workshops with youth, parents, teachers, and clinicians. With the overall goal to improve ADHD treatment adherence, the team made sure that adolescents had their voices heard and incorporated features to support behavioral change. The team evaluated the usability and feasibility of this intervention in a 20-participant pilot study, observing participant's self-regulation and parent's co-regulation techniques acquired from wearing the technology.



PRINCIPAL INVESTIGATOR



Kimberley Lakes,
Ph.D.



ORGANIZATION

University of California,
Riverside



RESEARCH PROFILE

[The CoolCraig App:
Promoting Health
by Improving Self-
Regulation in Adolescents
with ADHD](#)



FUNDED AMOUNT

\$378,705



RESEARCH TYPE

Completed



“This can be a really meaningful way to help support yourself, and to build the self-efficacy and the independent agency in being able to know what you need to manage yourself and to regulate emotions and behavior on a day-to-day basis.”

Dr. Kimberley Lakes

A feasible approach

This research illustrated the value of both co- and self-regulation for children with ADHD, and the role digital healthcare interventions can have in this model. During the COVID-19 pandemic with school provided by distance learning, CoolCraig provided structured support during challenging times. Drs. Lakes and Hayes gained a better understanding of designing technological interventions to enhance the support of CoolCraig users and plan to expand the prototype for promising future research.



Engaging and Empowering Patients: Other Research

The research stories highlighted in this report are only a subset of the work that AHRQ funds. The following table includes additional research related to Engaging and Empowering Patients that was either completed or newly awarded in 2021. To search the entire portfolio of research, please visit [AHRQ Funded Projects](#).

Empowering patients and caregivers to improve patient-centered care

The use of BedsideNotes—a new capability within an existing inpatient portal to share physicians’ inpatient notes with families at the bedside—will support parent engagement in the care of their hospitalized children, to improve patient care and prevent harm.

[Access Dr. Kelly’s Project Profile](#)

Publicly available, standards-based, interoperable clinical decision support (CDS) for chronic pain management, which is both patient- and clinician-facing, can provide end-to-end support for shared decision-making in real-world settings.

[Access Dr. Marcial’s Project Profile](#)

Integration of an electronic pediatric organ transplant quality-of-life tool into routine care has the potential to improve medication adherence and outcomes in this patient population.

[Access Drs. Mazariegos and Shemesh’s Project Profile](#)

A Fast Healthcare Interoperability Resources (FHIR)-enabled digital personal health record mobile app has the potential to enhance care coordination for families of children and youth with special healthcare needs and to inform improvements in family-centered care coordination that will be highly impactful for populations of patients with complex health needs across the age spectrum.

[Access Dr. Ming’s Project Profile](#)

Improving care during patient transitions

Using real-time patient-reported outcomes of hospitalized patients has the potential to reduce adverse events during care transitions by improving the identification of at-risk patients with multiple chronic conditions.

[Access Dr. Dalal’s Project Profile](#)

Engaging cancer patients to communicate medication-related experiences and concerns with their healthcare team via an electronic patient safety event reporting platform has the potential to reduce adverse medication events during hospital-to-home transitions of care.

[Access Drs. Jiang and Gong’s Project Profile](#)



Using digital healthcare tools in chronic disease management

Development and integration of tools to support pharmacological and behavioral treatment for children with attention deficit hyperactivity disorder may lead to improvement in behavioral outcomes.

[Access Dr. Epstein's Project Profile](#)

Telehealth Education for Asthma Connecting Hospital and Home (TEACHH) is an innovative intervention that integrates active engagement of children and caregivers, patient-centered educational support with medication labeling, and in-home smartphone teleconferencing followup with the potential to reduce overall morbidity for children at the highest risk of poor outcomes and use of costly acute healthcare services.

[Access Dr. Frey's Project Profile](#)

By adapting WiseApp for Spanish-speaking patients living with HIV, this research has the potential to improve medication adherence, potentially slowing progression of HIV and decreasing premature deaths.

[Access Dr. Schnall's Project Profile](#)

Depression-specific enhancements of patient portals increase patient activation and improve the ability of patients and providers to communicate.

[Access Dr. Turvey's Project Profile](#)



Optimizing Care Delivery for Clinicians

The DHR program funds research to support clinicians and other healthcare professionals in maximizing their ability to provide high-quality and safe healthcare to patients. This includes research to optimize clinical decision making by delivering the right information to the right people at the right times, so that clinicians can make the best care decisions, all the while ensuring that technology is designed and information is available to support cognitive work while reducing provider burden.

In 2021, the DHR program funded research projects that focused on optimizing care delivery for clinicians including research on: making CDS interventions more shareable and interoperable; improving healthcare technology design to advance patient safety; identifying risk with artificial intelligence (AI) and other machine learning digital tools; and optimizing data visualization to improve care.

Below are research stories told in the investigator's own words that focus on **optimizing care delivery for clinicians**.



Optimizing Care Delivery for Clinicians

Making clinical decision support interventions more shareable and interoperable

[Patient-Facing Clinical Decision Support to Improve Blood Pressure](#)

✓ COMPLETED

[Sharing the Decision, Sharing the Data: Interoperable Clinical Decision Support Tool for Chronic Pain Management](#)

⚙️ EMERGING

[Improving Electronic Health Record Usability for Patient Safety](#)

✓ COMPLETED

[Choosing What Clinicians See in an Electronic Health Record Can Reduce Cognitive Burden and Improve Decision Making](#)

✓ COMPLETED

Improving healthcare technology design to advance patient safety

[Designing Digital Healthcare Technology to Support Cognitive Team Work in Pediatric Trauma Settings](#)

✓ COMPLETED

Optimizing data visualization to improve care

[Understanding Hospitals' Resilience and Response to the COVID-19 Pandemic](#)

⚙️ EMERGING

[Visual Learning: Displaying the Data for Hypertension Management](#)

✓ COMPLETED

Identifying risk with artificial intelligence and machine learning digital tools

[Digital Tools to Support Care Coordination for People With Depression](#)

⚙️ EMERGING

[Predictive Modeling to Improve Screening and Referral for Unmet Need](#)

⚙️ EMERGING

Learn about [other research](#) related to this theme.



Patient-Facing Clinical Decision Support to Improve Blood Pressure

Translating hypertension guidelines into a patient-facing clinical decision support tool can engage patients in blood pressure management.

Patient involvement is key to blood pressure management

Nearly half of adults in the United States have high blood pressure, which is a major factor in heart attacks, strokes, and kidney disease. Health management is essential to patients with high blood pressure, as lifestyle changes can significantly reduce blood pressure to healthy levels, but maintaining their engagement and motivation is a challenge.

Dr. David Dorr, an internal medicine doctor and the chief research information officer at the Oregon Health and Science University, and his research team hypothesized that a patient-facing tool with robust CDS that provides the right information at the right time in the right format through the right channel could help patients better manage their blood pressure. Encouraging patients to set goals, like limiting salt/sodium intake and increasing physical activity, has shown to promote a patient's participation in blood pressure management while increasing care teams' understanding of patients' cardiovascular health.

Motivating patients to manage high blood pressure

Dr. Dorr and his team wanted to understand patient needs and preferences to inform how they could adapt CDS to better engage patients in controlling their high blood pressure. They interviewed and surveyed patients and care teams on their attitudes toward clinical practice guidelines for high blood pressure and patient-facing CDS tools. The feedback obtained served as the foundation for the creation of their tool, called Collaboration Oriented Approach for Controlling High Blood Pressure (COACH). COACH, using interoperable standards, incorporates adapted clinical blood pressure recommendations and best practices to provide an individualized display of information for the purposes of helping a patient manage their high blood pressure.



PRINCIPAL INVESTIGATOR



David Dorr, M.D., M.S.



ORGANIZATION

Oregon Health and Science University



RESEARCH PROFILE

[Translating Hypertension Guidelines into Practice: Development of Interoperable Clinical Decision Support](#)



FUNDED AMOUNT

\$938,621



RESEARCH TYPE

Completed



“We built a machine-encodable version of the recommendations that are intended for patients and then made the information available in an implementation guide and built COACH, which brings together the recommendations into a tool that connects to our electronic health record.”

Dr. David Dorr

Adaptation is required but feasible to help patients manage blood pressure

The research team iteratively tested the tool using simulated and real patient data. They found that patients and providers were ready to engage with COACH and provided substantial guidance on COACH’s optimization. They engaged patients to make sure the recommendations were understandable and felt appropriate and actionable. They also learned that COACH requires careful adaptation of clinical guidelines and identifying motivators for patient engagement. These lessons learned led to the development of an implementation guide to support replication and successful implementation in other organizations. Next steps, through a future study, include expanding COACH’s usefulness to people with lower digital literacy and testing its visualizations, reminders, and tailored messages in more real-world settings.



Sharing the Decision, Sharing the Data: Interoperable Clinical Decision Support Tool for Chronic Pain Management

The tailored and scaled implementation and evaluation of AHRQ's interoperable clinical decision support tools, MyPAIN and PainManager, have the potential to expand upon the shared decision-making processes used in chronic pain management to improve patient care and obtain optimal patient outcomes.

Patient-centered chronic pain care

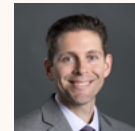
The U.S. opioid crisis is an ongoing public health epidemic, and millions of Americans suffer from chronic pain. Prescription of opioids has been under scrutiny in recent years to control inappropriate prescribing. While opioids can be part of an appropriate treatment plan for people with chronic pain, Drs. Christopher Harle and Ramzi Salloum believe that primary care providers delivering the right treatment for patients should involve shared decision making and could benefit from implementing tools that facilitate this process.

Improving interoperability to improve chronic pain care

With a goal to scale and disseminate interoperable CDS, the research team will use existing CDS tools for chronic pain treatment—MyPAIN and PainManager—in selected clinics at University of Florida Health and the OneFlorida Clinical Research Consortium. The implementation will be tailored to address the individual workflows of the clinic along with the needs of the population the clinics serve. MyPAIN and PainManager will aid clinicians in collaboratively addressing chronic pain with their patients by allowing them to share their understanding of the patient's condition, discuss individual patient goals, and come together with patients to make decisions about what care and treatment looks like going forward.



PRINCIPAL INVESTIGATORS



Christopher Harle,
Ph.D., M.S.,



Ramzi Salloum,
Ph.D., M.A., M.B.A.



ORGANIZATION

University of Florida



RESEARCH PROFILE

[Scaling Interoperable
Clinical Decision Support
for Patient-Centered
Chronic Pain Care](#)



FUNDED AMOUNT

\$2,952,700



RESEARCH TYPE

Emerging



“We will work to bring patients and clinicians closer together to share their experiences, share patient-reported outcomes, share their constraints and their goals. I’m very hopeful those kinds of tools will advance patient-centered treatments, equitable care, and equitable health outcomes.”

Dr. Christopher Harle

Improving medical and technological outcomes

The research team expects that tailored CDS implementation support will increase MyPAIN and PainManager’s adoption and facilitate greater shared decision making among clinicians treating patients with chronic pain. It is expected that these efforts will also lead to improved patient outcomes and positive results in chronic pain management. Beyond pain management, this research will provide significant advancement in scaling and adoption strategies for interoperable CDS by examining and evaluating the implementation of MyPAIN and PainManager in different clinical settings and across different types of EHRs.



Improving Electronic Health Record Usability for Patient Safety

Analysis of patient safety event reports showed an association between electronic health record (EHR) usability and patient safety in both adults and children and led to development of an EHR assessment tool that healthcare facilities can use to identify usability and safety issues.

Poor EHR design and usability hurts patients and burns out providers

While EHRs are used almost universally by hospitals and healthcare facilities across the country, these systems are not usually deliberately designed, developed, and implemented with a focus on usability. Poor design and usability can lead to errors that compromise patient safety and disrupt provider workflow, contributing to increased cognitive burden. Such challenges can lead to provider burnout, resulting in providers leaving the profession. To better understand EHR usability and safety issues, Dr. Raj Ratwani and a team of researchers at MedStar Health's National Center for Human Factors in Healthcare partnered with computer scientists and clinical experts at Georgetown University and the Institute for Safe Medication Practices to pinpoint digital healthcare-related patient safety gaps in current EHR systems.

Identifying EHR usability issues and potential harm to patients

The research team developed algorithms to identify usability and safety issues from patient safety event reports. Explicit language was identified to associate possible patient harm with an EHR usability issue, in both adults and children. The analysis allowed the team to systematically categorize the EHR-related patient safety events as usability design- or implementation-related issues, and identify the specific user-centered design or implementation process that would have prevented the patient safety event.



PRINCIPAL INVESTIGATOR



Raj Ratwani, Ph.D.



ORGANIZATION

MedStar Health
Research Institute



RESEARCH PROFILE

[Developing
Evidence-based User
Centered Design
and Implementation
Guidelines to Improve
Health Information](#)



FUNDED AMOUNT

\$1,224,973



RESEARCH TYPE

Completed



“One of the really seminal things that came out of this work is that for the first time, we showed the connection between electronic health record usability and patient safety issues, essentially that patients can be harmed because of the way some of these systems are designed and being used.”

Dr. Raj Ratwani

Improving EHR usability and safety for any organization

Based on these results, an EHR usability and safety evaluation tool was developed and successfully tested at two healthcare facilities. This tool can be used by any healthcare facility to identify specific issues in its EHR and to identify potential solutions to those issues through usability improvements. The tool includes a guide for how to perform the assessment so that it can be self-administered and disseminated broadly.



Choosing What Clinicians See in an Electronic Health Record Can Reduce Cognitive Burden and Improve Decision Making

Giving clinicians the ability to customize the patient electronic health record display reduces cognitive burden, saves time, and supports decision making in busy clinical environments.

Increased provider cognitive burden risks to patient safety from poor EHR design

While the use of EHRs has transformed care, EHRs can often pose a burden for clinicians. Displays in EHRs often force clinicians to navigate through multiple menus and screens to access patient information, including laboratory panels, clinical notes, orders, and medications. This type of data display requires clinicians to remember multiple pieces of complex information from various places and then process it collectively to make care decisions. The disjointed process adds to the cognitive load for clinicians, increases the time needed to develop a treatment plan, and is impractical in busy clinical environments where workflow interruptions are common. These combined factors increase the likelihood of clinician error, which in turn can harm patients.

“I could see there was a big gap between programmers and clinicians and that software often didn’t reflect the way that clinicians work and think. I started wishing that if you could give clinicians the ability to design and create some of their own tools themselves, it might result in better fit to their actual tasks.”

Dr. Yalini Senathirajah

Selecting what you see in an EHR

Dr. Yalini Senathirajah and a team of researchers at the University of Pittsburgh School of Medicine wanted to know if there was a way to let clinicians decide what information from EHRs they would prefer to see. The team developed and tested an application called MedWISER



PRINCIPAL INVESTIGATOR



Yalini Senathirajah,
Ph.D.



ORGANIZATION

University of Pittsburgh



RESEARCH PROFILE

[Finding the Safer Way:
Novel Interaction Design
Approaches to Health IT
Safety: Final Report](#)



FUNDED AMOUNT

\$965,791



RESEARCH TYPE

Completed



(Medical Widget-based Information Sharing Environment), which uses a distinctive interaction style in which the user can “compose” or assemble desired information on the same screen, or use preset summaries created by other clinicians within the same health system. As Dr. Senathirajah noted, “With MedWISER, you can place the things you want on the same screen. So you can say, I want to see this lab test, and I want next to it to see the x-ray. And I want this note that the doctor wrote when the patient came in, and I want this graph of the test results from last week. You can assemble the information the way that can help you best make decisions.”

Customizing displays of information to reduce cognitive burden

The research team studied clinicians’ use of the composable MedWISER tool compared with use of a conventional EHR display.

They found that the ability to customize the EHR display reduced clinicians’ cognitive burden, saved time, and supported decision making in high-stress situations.

This research shows that clinicians’ involvement in technology design is integral to ensuring that systems support their work, and does not increase their burden.



Designing Digital Healthcare Technology to Support Cognitive Team Work in Pediatric Trauma Settings

Simple and informative graphic displays in emergency department trauma bays can streamline and expedite information sharing across caregiver roles to improve patient care and safety.

Conveying critical information amidst chaos

Trauma is the leading cause of death and permanent paralysis among children. In a Level I pediatric trauma care center, where diagnosis and treatment care and decisions are chaotic and time-sensitive, an average of 60 different roles may be taking care of a patient at some point during their stay in the hospital. For example, as many as 20 care providers may show up in a pediatric ED trauma bay in minutes depending on the severity of the patient's condition. Professional care roles include physicians (emergency medicine, anesthesiology, general surgery), nurses, respiratory therapists, pharmacists, case managers, social workers, and other sub-specialties depending on the needs of the child. Each needs to know what has happened: the initial incident, the current clinical condition including what has been done so far (in terms of diagnosis and treatment), and what the next steps are (e.g., surgery, transfer). It is imperative that each role coordinates and communicates their patient assessment and plan across other care team members as they cycle in and out of the individual's trauma bay.

But how is information shared in the fast-paced, high-stress and high-consequence environment of the trauma bay? Dr. Ayse Gurses, a human factors engineer, says it is usually through searching for a familiar face, such as another physician or nurse, who has already arrived to the trauma bay and busy taking care of the child and asking them about what happened to the child, what the current clinical condition is, and what the plan is. However, these colleagues may not be available as they are also trying to take care of the child and it may be dangerous to interrupt them when it pertains to making what may be life-saving decisions for which every minute is precious.



PRINCIPAL INVESTIGATOR



Ayse P Gurses,
Ph.D., M.S., M.P.H.



ORGANIZATION

Johns Hopkins University



RESEARCH PROFILE

[Care Transitions and Teamwork in Pediatric Trauma: Implications for HIT Design](#)



FUNDED AMOUNT

\$2,493,921



RESEARCH TYPE

Completed



Optimizing information presentation using graphic displays

Dr. Gurses and her team wanted to find a better way to support the information-sharing process and cognitive team work with the use of technology. Through multiple qualitative studies guided by human factors and systems engineering approaches, they interviewed and conducted design sessions with pediatric trauma staff to understand and facilitate the cognitive processes at play in this chaotic and high-paced environment. Their input and feedback informed the iterative development of graphic displays to present key patient clinical data and trends to trauma bay staff. The process was highly participatory on purpose because the team was designing technology for people with an array of roles and information needs.

“The trauma surgeon may want to see some clinical data point or representation that is different from the anesthesiologist and the nurse, and vice versa. In the process, we learned how different specialties’ thinking processes and perspectives differ, and designed the technology accordingly to support them individually and as a team.”

Dr. Ayse Gurses

Conveying critical information more reliably and efficiently with well-designed, large-format graphic displays

Human-centered design takes time but pays off. Pediatric trauma staff, who participated in the studies found the dashboard useful, agreed that it would support situational awareness and would likely improve both patient safety and efficiency.

This research improved the understanding of the cognitive processes of pediatric care teams and advanced knowledge of digital design elements to support them.

The evaluation also elucidated important design feedback and improvement opportunities. “It is possible to design technology that will support team work and patient safety while also reducing care professional workload and stress, which is amazing,” said Dr. Gurses.



Understanding Hospitals' Resilience and Response to the COVID-19 Pandemic

Pandemics put extraordinary demands on healthcare capacity and studying hospital resilience can increase our preparedness for future pandemics.

The COVID-19 pandemic pushed healthcare organizations and hospital systems to their limits

The COVID-19 pandemic exposed vulnerabilities across the U.S. healthcare and public health systems. It tested hospitals' resilience. The healthcare system had to adapt almost overnight, facing prevention, preparation, and response challenges. Hospitals persevered, using available data and guidance—without the benefit of full evidence-based research—to implement containment strategies, to ensure they had enough testing supplies and personal protective equipment, and to anticipate surge events, while securing sufficient staffing and space.

A robust medical response, akin to disaster situations, requires hospitals to engage in rapid evidence-based decision making about resource allocation and patient care. Unfortunately, while digital healthcare technology has the potential to enhance the emergency pandemic response, real-time data are not always available or optimally presented.

Studying hospital resilience to prepare for future pandemics

New York City was an early epicenter of the COVID-19 pandemic and suffered greatly. Drs. David Kaufman and Yalini Senathirajah wanted to understand how hospitals adapted to the pandemic, the kinds of data that hospital decision makers needed, and what the critical barriers were to provide effective responses for future pandemics.

The research team is evaluating and contrasting the resilience, decision-making approaches, and human-factors engineering related to clinical workflows between two hospitals to understand a range of known and emerging information needs that can support an effective emergency response. The team is studying data from



PRINCIPAL INVESTIGATORS



David Kaufman, Ph.D.



Yalini Senathirajah, Ph.D.



ORGANIZATION

SUNY Downstate Medical Center, The University of Pittsburgh Medical School



RESEARCH PROFILE

[Evaluating and Enhancing Health Information Technology for COVID-19 Response Workflow in a Specialized COVID-19 Hospital in a Medically Underserved Community](#)



FUNDED AMOUNT

\$894,961



RESEARCH TYPE

Emerging



two hospitals: the University Hospital of Brooklyn (UHB), a safety net hospital with fewer resources, highly affected by COVID-19, and Columbia University Irving Medical Center (CUIMC), which serves the predominantly Latino Northern Manhattan communities of Heights/Inwood.

“We wanted to understand how the surge in patients with COVID-19 impacted workflow, how resources were allocated and if they were adequate, how we could leverage existing information technology, and how we can be better prepared. How we could make it easier to access patient information to get a snapshot of the hospital, how many patients we had, how many beds were filled, how many beds were available, and how many people were on respirators.”

Dr. David Kaufman

Improving technology to support pandemic response

As a first step in evaluating and making workflow improvements, the team is interviewing and observing members of the UHB and CUIMC emergency response teams and interviewing key decision makers, including directors of clinical departments. They will then employ cognitive engineering frameworks such as the Systems Engineering Initiative for Patient Safety and other sociotechnical approaches to technology-mediated work practices to design and prototype novel digital healthcare solutions, with the goal of augmenting hospital resilience in pandemics. Then, the research team will investigate how its proposed methods and tools support the UHB emergency management response team’s information and workflow needs. A set of prototypes, including dashboards, visualizations, and data integration tools, will be developed. The research team hopes that introducing novel and more efficient approaches to improve decision making and emergency responses during a pandemic will enhance the quality of patient care, safety, and well-being.



Visual Learning: Displaying the Data for Hypertension Management

A clinical decision support tool helps patients and physicians use at-home measured blood pressure data to better understand hypertension control and inform shared treatment decisions.

Keeping blood pressure under control

About half of American adults are diagnosed with hypertension, and many take medications to lower blood pressure. Prescribed medication is effective, but many patients struggle to keep their blood pressure controlled. At-home blood pressure monitoring is a common solution to better capture a patient's blood pressure outside of the clinical setting, but the measurements do not always improve the clinician's understanding of the patient's control. Dr. Richelle Koopman, the Vice Chair of Family and Community Medicine at the University of Missouri and a practicing physician, saw an opportunity to integrate at-home readings into a clinician's workflow to inform shared treatment decisions.

Between the April 2018 soft launch of the new home blood pressure portal entry screen and February 2020, over 1,000 unique patients uploaded over 15,000 home blood pressure data pairs using the new tool.

Sharing the data from home

Dr. Koopman and her team developed a CDS tool to send at-home blood pressure measurements to the clinician's EHR and provide instantaneous data visualization. The user-centered design of the tool was crafted to be accessible to patients in a simple and comprehensible way, allowing for shared decision making among the patient and clinician on next steps for hypertension management and medication timelines.



PRINCIPAL INVESTIGATOR



Richelle Koopman,
M.D., M.S.



ORGANIZATION

University of
Missouri at Columbia



RESEARCH PROFILE

[Optimizing Display of
Blood Pressure Data to
Support Clinical Decision
Making](#)



FUNDED AMOUNT

\$2,230,821



RESEARCH TYPE

Completed



“We are trying to improve blood pressure by getting home blood pressure data to the physicians in their electronic workflow in a form that they could use it, getting the right information to the right people in the right places at the right times and in the right manners.”

Dr. Richelle Koopman

Integrating and visualizing data

The research team recorded and analyzed 89 hypertension patient visits to understand how data visualization sent to a clinician’s EHR supported hypertension care decision making compared with paper-recorded measurements. Integrated data visualization proved to offer more meaning about hypertension for patients, while also cognitively connecting medication changes to blood pressure trends. The direct integration of home blood pressure into clinical workflow proved to show greater patient engagement in hypertension management decisions.



Digital Tools to Support Care Coordination for People With Depression

Adaptation of a digital mental health intervention has the potential to improve the coordination of and access to mental health services in ambulatory care settings.

Coordinating scarce mental health services to improve depression care

Care coordinators are typically nurses or social workers who provide guidance and resources to patients who have difficulty managing their healthcare. Unfortunately, care coordinators often struggle to find mental health services—especially for depression management—as resources are limited, waitlists for services are long, and stigmas prevent patients from asking for help.

Technology helping care managers to manage patients' mental health

As a clinical psychologist, Dr. Emily Lattie is well aware of how important care coordination services are to patients who have acute or chronic health conditions along with depression. To overcome challenges supporting patients, she and her Northwestern University-based team are adapting and implementing a digital mental health intervention that is packaged within a patient management system for depression to increase access to and improve coordination of mental health services in ambulatory care coordination.

The enhanced system, referred to as a technology-enabled service (TES), will include the IntelliCare platform, which includes a patient-facing app targeting specific psychological strategies, and a care coordination dashboard. The adaptation of the IntelliCare technology, service protocols, and development of implementation strategies will result in a TES that helps patients develop self-management skills and provides care managers with information and tools to manage the patient's mental health, thereby improving healthcare quality and patient outcomes.



PRINCIPAL INVESTIGATOR



Emily Lattie, Ph.D.



ORGANIZATION

Northwestern University



RESEARCH PROFILE

[Implementation of Digital Mental Health Tools in Ambulatory Care Coordination](#)



FUNDED AMOUNT

\$1,852,918



RESEARCH TYPE

Emerging



“We know that stress from health conditions affects people’s mental health and their quality of life. We also know that having poor mental health or a lot of stress makes it a lot more challenging to manage physical health conditions. So people often wind up in this unfortunately challenging cycle. By providing training support services to professionals like care coordinators, who work with folks who often experience challenges, we’re able to find another entry point to help people.”

Dr. Emily Lattie

Increasing access to mental health care

The team will study how the TES (1) increases access to care for depression for patients in four teams implementing the intervention, and (2) impacts depression severity. It will also develop an implementation guide to support replication and sustainability in other healthcare systems. As Dr. Lattie noted, “While this research was proposed before the COVID-19 pandemic, this work has become more timely than ever as we’ve been having an increasing mental health crisis on our hands in the United States.”



Predictive Modeling to Improve Screening and Referral for Unmet Needs

Using predictive modeling and clinical decision support tools to identify people with unmet social needs has the potential to increase referrals to social services.

Unmet social needs can significantly affect patient health

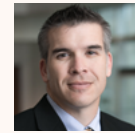
Unmet social needs—including housing, food, utilities, access to care, ability to obtain prescribed medications, and transportation—have a negative impact on people’s health. They also increase people’s use and cost of healthcare services, increase burden on EDs, and make health disparities worse. While an ED encounter is a prime opportunity to screen patients and refer them to needed social services, the use of the current interview and questionnaire screening model is limited due to time constraints, ED workflow patterns, and the stigma associated with these questions.

Using predictive models to identify people with unmet social needs

Dr. Joshua Vest and a team of researchers at Indiana University-Purdue University at Indianapolis are studying whether predictive modeling can accurately identify individuals with unmet social needs. The models will use more than 150 data elements from the EHR, HIE, state social service organizations, geocoded data sets, and public health data sources. The team wants to see if the models are more effective than a standard self-administered questionnaire in identifying patients with various social needs. The comparison of results will inform the development of a CDS tool to increase referrals to appropriate social and behavioral services.



PRINCIPAL INVESTIGATOR



Joshua Vest,
Ph.D., M.P.H.



ORGANIZATION

Indiana University-
Purdue University at
Indianapolis



RESEARCH PROFILE

[Predictive Modeling
for Social Needs in
Emergency Department
Settings](#)



FUNDED AMOUNT

\$1,967,217



RESEARCH TYPE

Emerging



“Social determinants of health and unmet need are really what drive health and complicates care. For example, when patients say, “I have to make a choice between paying for food or medication.” These are really difficult problems that the healthcare system is being increasingly asked to address. How do we best help healthcare organizations manage those patient needs? We have to figure out who has those needs, how to address them, and how to best match resources [to meet them].”

Dr. Joshua Vest

Quantifying the impact of real-time screening for social needs

The team will evaluate the CDS tool in an urban safety net hospital to see if it reduces repeat ED visits and increases referrals to social and behavioral service providers. The research is innovative in that it is applying predictive modeling with personal, social service, and clinical context data, and is shifting social need screening research to the ED setting. In addition, the team is transforming screening results into actionable information for service referral, as organizations are not currently doing this. The use of this real-time CDS tool will provide ED clinicians with a clear course of action and improve current screening practices that often fail to yield actionable information.



Optimizing Care Delivery for Clinicians: Other Research

The research stories highlighted in this report are only a subset of the work that AHRQ funds. The following table includes additional research related to Optimizing Care Delivery for Clinicians that was either completed or newly awarded in 2021. To search the entire portfolio of research, please visit [AHRQ Funded Projects](#).

Making clinical decision support interventions more shareable and interoperable

A Pharmacogenomics (PGx) clinical decision support alert program has a role in improving outcomes and represents a wholistic approach to care when a PGx Testing program is combined with a CDS alert program.

[Access Dr. Devine's Project Profile](#)

Use of DDInteract resulted in patients favoring pain treatments with less risk of gastrointestinal bleeding, with this tool having broad applicability to other therapeutic interventions that would benefit from this model of shared decision making.

[Access Dr. Malone's Project Profile](#)

Improving healthcare technology design to advance patient safety

The issue of communication errors during intensive care unit interprofessional patient rounds can be improved with the use of real-time simultaneous review of patient data by all members of the rounding team.

[Access Dr. Gold's Project Profile](#)

Integrating prescription drug monitoring programs into existing electronic health record systems may improve provider use and accessibility, reduce high-risk opioid prescribing practices, and improve opioid-related overdose outcomes.

[Access Dr. Hartung's Project Profile](#)

Novel wearable technologies and modes of interaction may improve prehospital care coordination while allowing emergency care professionals to have their hands free of technology and allow them to better focus on the patient, ultimately improving outcomes.

[Access Dr. Zhang's Project Profile](#)



Optimizing data visualization to improve care

The use of a shared decision making tool resulted in patients with atrial fibrillation having more confidence in choosing to use oral anticoagulants to prevent stroke.

[Access Dr. Dorsch's Project Profile](#)

Identifying risk with artificial intelligence and machine learning digital tools

The use of a novel screening tool has the potential to identify patients at highest risk of emergency department return and associated severe disease and decompensation from COVID-19, prompting earlier hospital admission and higher levels of care in the disease course, which may reduce morbidity and mortality.

[Access Dr. Galarraga's Project Profile](#)

Clinical decision support tools that incorporate patient and caregiver preferences may promote the uptake of alternative acute care models, such as providing hospital-level care at home, which can reduce healthcare costs and mitigate morbidity and mortality risks associated with in-hospital admission.

[Access Drs. Kowalkowski and McWilliams' Project Profile](#)

The use of an automated method to screen for HIV risk among hospitalized patients with substance misuse has the potential to increase the identification of those at risk to afford them access to testing, prevention, and intervention.

[Access Dr. Thompson's Project Profile](#)

By validating the use of computable social factor phenotypes to generate an assessment of social factors using readily available data, there is the potential to increase their collection, act on them, and reduce healthcare utilization and costs.

[Access Dr. Vest's Project Profile](#)

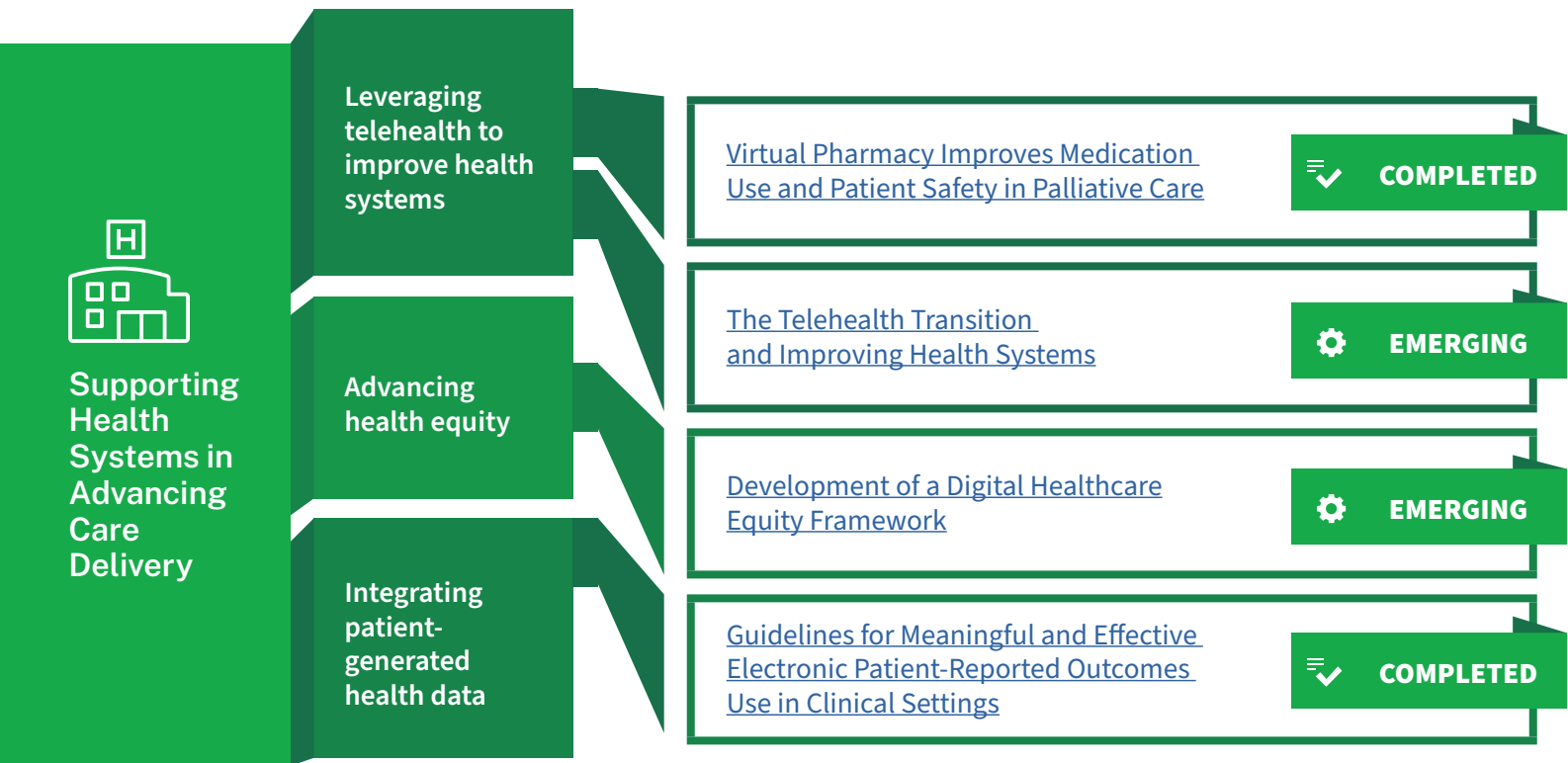


Supporting Health Systems in Advancing Care Delivery

DHR-funded research focuses on supporting health systems in advancing care delivery at the health systems or organizational level. Efforts to promote interoperability and leverage data and technologies to strengthen the quality of services delivered can support health systems in advancing care delivery.

In 2021, the DHR program also funded research projects focused on health systems, including research on: leveraging telehealth to improve health systems; integrating patient-generated health data; and advancing the digital health equity agenda.

Below are research stories told in the investigator’s own words that focus on **advancing care delivery at the health systems level**.



Learn about [other research](#) related to this theme.



Virtual Pharmacy Improves Medication Use and Patient Safety in Palliative Care

Including virtual pharmacists in palliative care teams can reduce adverse drug interactions and increase the quality of life for people who are very ill.

Avoiding adverse drug interactions that worsen conditions at best—and are lethal at worst: pharmacists know how

Palliative care involves making people who have chronic or terminal illness as comfortable as possible. While this care does not focus on treatment, palliative care patients are often on many medications. These patients' physiological changes—due to advanced illness, the natural aging process, and multiple-drug treatment—affect their ability to metabolize drugs. Their need for medicine changes, too; for example, sleep may improve after a person moves from an inpatient facility to his or her home, yet medications are rarely deprescribed.

Being on many medications puts patients at high risk of adverse drug-drug interactions (DDIs), the fifth-leading cause of death in the United States. Yet, as Dr. Janet Bull, a clinician at Four Seasons, a palliative and hospice care organization in rural North Carolina, acknowledges, “As a clinician it’s so hard to keep up with how one medication interacts with another. Some of our patients are on 20 different medications.”

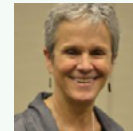
The addition of a virtual pharmacist to a CBPC team improved medication and symptom management, resulting in providers updating dosing or timing changes and adding or deprescribing a medication approximately 65 percent of the time.

Incorporating a medication expert virtually on the team

Dr. Bull and her colleagues provide community-based palliative care (CBPC) to meet the physical, psychosocial, and spiritual needs of patients with serious illnesses. But while pharmacists are part of hospital-based teams, they are rarely part of CBPC teams in the



PRINCIPAL INVESTIGATOR



Janet H Bull,
M.D., M.B.A.



ORGANIZATION

Four Seasons Hospice and Palliative Care



RESEARCH PROFILE

[A Demonstration Project: Assessing the Significance and Impact of Utilizing a Novel Telemedicine Application in the Delivery of Community Based Palliative Care in a Rural Seriously Ill Population](#)



FUNDED AMOUNT

\$ 300,000



RESEARCH TYPE

Completed



United States. With the goal of reducing DDIs, Dr. Bull and her team tested a telehealth application that included a virtual pharmacist consultation. Pharmacists assessed each patient's medication list, identified DDIs, and made recommendations to clinicians. The pharmacists were also available for telecounsel with clinicians and patients.

“For me to be able to dial up a pharmacist and say, ‘Hey, can you help me understand the best way to treat pain in this patient who’s already on these different medications and pain medications?’ is wonderful.”

Dr. Janet Bull

Rounding out a care team: everybody benefits

Patients in the study had an average of three DDIs each, and more than 90 percent of these were moderate or severe. The clinicians welcomed the pharmacists' expertise and implemented their recommendations, which usually involved dosing or timing changes and adding or deprescribing a medication approximately 65 percent of the time.

The pharmacists also loved being part of the clinical interdisciplinary team, which included a physician or nurse practitioner, social worker, and occasionally chaplain, because they had a whole-person understanding of individual patients and access to their medical records, which allowed them to make informed recommendations. Although study enrollment was cut by two-thirds because of COVID-19, it showed that the addition of a virtual pharmacist to a CBPC team improved medication and symptom management, and enhanced patient and provider knowledge.



The Telehealth Transition and Improving Health Systems

Evaluation of the rapid transition to telehealth due to the COVID-19 pandemic will inform patient care post-COVID-19 to ensure equal access and high-quality care.

Crisis mode activated

The COVID-19 pandemic presented the healthcare system with one of the biggest public health crises in modern time, requiring healthcare organizations to quickly deploy emergency operation models to deliver care. Across the country, healthcare organizations transitioned to telehealth and implemented the requisite infrastructure to accommodate a range of services for millions of Americans. While the Medical University of South Carolina (MUSC) in Charleston had a previously existing emergency plan including telehealth consultation and screenings, in the early weeks of the pandemic, MUSC expanded its telehealth programs. However, MUSC did not expect the diverse needs and high volume of services during the initial months of the pandemic. Thus, Drs. Kit Simpson and Jillian Harvey wanted to analyze MUSC's telehealth response and identify areas of need to better prepare the health system for future emergencies.

Taking a larger look

This research focused on evaluating the telehealth response to the pandemic with an aim towards understanding how to improve the response for future emergencies. In particular, the research focused on addressing disparities in care. To best identify issues of access, quality, and disparities within telehealth services, the researchers developed social determinants of health measures by abstracting data from their EHR system. As the research moves forward, the team will collect qualitative and quantitative data on healthcare use, barriers to care, and patient experience. The focus will include care among vulnerable populations, with people from rural communities and digital deserts and patients suffering from stroke, sickle cell disease, diabetes, and Alzheimer's disease.



PRINCIPAL INVESTIGATORS



Kit Simpson, Dr.P.H.,



Jillian Harvey,
Ph.D., M.P.H.



ORGANIZATION

Medical University of
South Carolina



RESEARCH PROFILE

[Leveraging Health System Telehealth and Informatics Infrastructure to Create a Continuum of Services for COVID-19 Screening, Testing, and Treatment: A Learning Health System Approach](#)



FUNDED AMOUNT

\$999,845



RESEARCH TYPE

Emerging



Based on the initial research, a dashboard was developed to show real-time feedback on how ambulatory telehealth affects care; this will allow for better planning around resource allocation or restructuring of current healthcare delivery models.

Telehealth informing patient care post-COVID-19 to ensure equal access and high-quality care

Through EHR telehealth data analysis, patient and healthcare provider surveys and interviews, and examination of the healthcare costs during COVID-19, this research will provide insights for how best to restructure care with telehealth implementation. Findings will provide evidence needed to better prepare healthcare systems in future emergencies and to mitigate effects of racial, geographic, and economic disparities present in the current healthcare delivery systems.

“The pandemic didn’t hit everybody equally, and we were getting increasingly concerned about disparities. We’ve always been rule-focused. We’ve always been primary care focused and concerned about getting expert services out into a rural area. It became very clear that some tools were missing.”

Dr. Kit Simpson



Development of a Digital Healthcare Equity Framework

A framework and guide to help creators and users of healthcare solutions that involve digital technologies ensure that their solutions are equitable.

Benefits of digital healthcare technologies limited by the digital divide

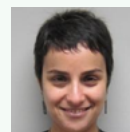
The development and use of technologies that improve patient engagement, support clinical decisions, and optimize healthcare delivery continue to grow. Digital healthcare technologies can be patient-facing—like mobile health apps and patient portals—and clinician-facing—like CDS tools and risk prediction algorithms. However, a number of obstacles limit the use and benefit of these tools, including poor engagement of patients in the design of the technologies and a lack of digital literacy and broadband access—collectively known as the “digital divide.” The health benefit of solutions utilizing digital tools will remain limited unless the characteristics, needs, and capabilities of all patient groups are considered in the solution’s design and implementation.

A framework and guide to support digital healthcare equity

A team of researchers from Johns Hopkins University, led by Drs. Elham Hatef and Matthew Austin, is developing a framework and an accompanying guide that will support equity in designing and deploying digital healthcare solutions. After the team conducts an environmental scan of related frameworks and practices, they will draft the framework and guide with feedback and recommendations from experts in digital healthcare and health equity.



PRINCIPAL INVESTIGATORS



Elham Hatef,
M.D., M.P.H.,



Matthew Austin,
Ph.D.



ORGANIZATION

Johns Hopkins University



RESEARCH PROFILE

[Creating a Digital Healthcare Equity Framework With an Accompanying Guide for Its Use](#)



FUNDED AMOUNT

\$292,314



RESEARCH TYPE

Emerging



“To highlight some of the challenges of digital medicine, when you physically go to a doctor’s office, you are generally in a place where you can have a private conversation with your provider about your health concerns. With a televisit, you are in your bedroom or your living room trying to have that same conversation. You may not be in a position to share confidential health information in quite the same way.”

Dr. Matthew Austin

Dissemination to facilitate equitable healthcare technology

The framework and guide will apply to patient- and clinician-facing solutions and be disseminated to health systems, public entities, and digital healthcare vendors. Drs. Hatef and Austin hope that the digital healthcare equity framework and guide can help organizations and vendors create and implement equitable healthcare solutions when those solutions involve digital technologies.



Guidelines for Meaningful and Effective Electronic Patient-Reported Outcomes Use in Clinical Settings

Governance, integration, and reporting are key systems-level principles that support incorporation of electronic patient-reported outcomes into clinical practice.

Difficulties of integrating valuable patient-reported outcomes PROs into care

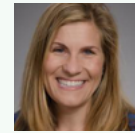
PROs are data that can yield insights into health status, function, symptom burden, adherence, behavior, and quality of life. Traditionally, PRO data were collected via pen and paper (e.g., answering paper survey questions about physical function), but technological advances have enabled the collection and use of electronic PROs (ePROs) (e.g., completing a web-based survey on physical function and sending the results to your doctor). However, integrating PRO data into existing systems and workflows is difficult. Leveraging ePRO data requires scaling and balancing the needs of individual users with the health system at large.

Community of practice: group think

Dr. Danielle Lavalley saw the need to create guidelines to facilitate meaningful and effective ePRO use in dynamic, real-world clinical settings. She and a University of Washington (UW)-based team convened a community of practice—a group of people with a common concern and interest in generating and sharing knowledge and best practices about it. For this research, the community of practice included stakeholders both local (individuals in the UW Medicine health system who have a breadth of experiences related to ePRO use, health IT, workflow, and health system leadership) and national (individuals part of professional groups associated with PRO measurement and practice, medical informatics, and health services research).



PRINCIPAL INVESTIGATOR



Danielle Lavalley,
Ph.D., Pharm.D.



ORGANIZATION

University of Washington



RESEARCH PROFILE

[Developing Design Principles to Integrate Patient-Reported Outcomes \(PROs\) Into Clinical Practice Through Health Information Technology: Data, User Experience, and Workflow Requirements for PRO Dashboards](#)



FUNDED AMOUNT

\$2,445,560



RESEARCH TYPE

Completed



“How do we use patient-reported outcome measures to advance care and help people make the best decisions about their health in partnership with their healthcare team? From both a research and a practice standpoint, what I saw was that we had measures that were getting integrated in different ways but there wasn’t a common approach [to doing so]. From a system standpoint, it really becomes hard to navigate capturing similar types of information in different types of ways.”

Dr. Danielle Lavalley

Disseminating these guidelines for all to use

Over 4 years, the community of practice analyzed peer-reviewed literature on ePRO use, talked with clinical providers, cataloged local ePRO use cases, and monitored ePRO implementation within UW’s own EHR system.

The group identified 24 guidelines across three thematic areas: governance, integration, and reporting. The guidelines highlight strategies to balance health system goals and resources, how to implement ePROs in clinical care, and how to translate ePRO data into actions that support healthcare transformation. Health systems can use the guidelines regardless of the specific technology platform or PRO measurement approach, which enables them to be adapted to particular context. The final guidelines and supporting tools and resources are available as a public web-based toolkit (epros.becertain.org).



Supporting Health Systems in Advancing Care Delivery: Other Research

The research stories highlighted in this report are only a subset of the work that AHRQ funds. The following table includes additional research related to Supporting Health Systems in Advancing Care Delivery that was either completed or newly awarded in 2021. To search the entire portfolio of research, please visit [AHRQ Funded Projects](#).

Leveraging telehealth to improve health systems

The ability to assess a patient for stroke while being transported in an ambulance has the potential to improve prehospital risk assessment of stroke during the critical window that reduces adverse consequences from strokes.

[Access Dr. Chalil Madathil's Project Profile](#)

Bringing together telehealth and emergency medicine leaders with the goal to develop a national research agenda to support telehealth in emergency medicine supports efforts to improve healthcare access and health outcomes, and reduce disparities for patients seeking emergency care.

[Access Dr. Clark's Project Profile](#)

Advancing the digital healthcare research agenda

Providing a forum to bring together a broad range of stakeholders among academia, government, and industry on the trends and knowledge gaps in HIT+A facilitates collaboration and promotes the opportunity for these stakeholders to understand critical issues in practice, and the most pressing policy agenda items that are in need of rigorous scientific research.

[Access Dr. Agarwal's Project Profile](#)



Integrating patient-generated health data

A new patient-generated health data (PGHD) guide supports ambulatory care settings of all types in the design and implementation of successful PGHD programs that can improve patient outcomes.

[Access Dr. Cohen's Project Profile](#)

Optimizing PRO data visualization with clinicians' and patients' input will improve clinicians' ability to effectively synthesize and communicate complex data to provide patient-centered clinical management.

[Access Drs. Gold and Bertini's Project Profile](#)

Facilitating data exchange between public health and clinical care information technology systems and across information systems within public health has the potential to improve data-informed decision making and surveillance of vaccine-preventable diseases, including COVID-19.

[Access Dr. Rajamani's Project Profile](#)

Advancing health equity

By directly engaging Medicaid medical directors and clinician thought leaders to identify Medicaid challenges amenable to technology solutions, the likelihood that technology investments will be made in areas of potential benefit to beneficiaries and programs will increase.

[Access Dr. Kennedy's Project Profile](#)

Research Dissemination

The impact of AHRQ-funded research goes beyond the studies themselves, as the dissemination of research findings from the DHR program is critical to the transfer of successful digital healthcare knowledge, tools, and strategies that improve healthcare delivery, optimize clinician decision making, and engage patients and caregivers.

Throughout the year, DHR-funded researchers and staff share and showcase their research findings in several ways that include publishing in peer-reviewed journals, presenting at health- and informatics-focused conferences, and during AHRQ national webinars. These activities highlight the importance of DHR program funding in advancing digital healthcare.



AHRQ-Funded Researchers Disseminate Findings in High-Impact Journals

In 2021, AHRQ-funded researchers published over 100 research articles in peer-reviewed journals and book chapters, including the following:

Evaluation of a Clinical Decision Support Strategy to Increase Seasonal Influenza Vaccination Among Hospitalized Children Before Inpatient Discharge

In the article, [Dr. Evan Ornstein](#) outlines his study seeking to understand if a CDS strategy is associated with improved influenza vaccination rates before discharge among eligible hospitalized children. In the quality improvement study, the combination of a default-checked influenza vaccine order in admission order sets for eligible patients with a nursing script using a presumptive strategy to offer the vaccine was associated with significantly higher odds of the hospitalized child receiving the influenza vaccine compared with concurrent and historical controls. This study suggests that a user-centered CDS strategy may improve vaccination rates among vulnerable, hospitalized children.

Comparison of an Artificial Intelligence–Enabled Patient Decision Aid vs. Educational Material on Decision Quality, Shared Decision Making, Patient Experience, and Functional Outcomes in Adults With Knee Osteoarthritis

In the publication, [Drs. Kevin Bozic and Joel Tsevat](#) describe how an AI-enabled decision aid generated using PRO measurements compares with education only on decision quality, patient satisfaction, and functional outcomes among individuals with knee osteoarthritis considering total knee replacement. The randomized clinical trial of 129 patients demonstrated statistically significant improvement in decision quality, level of shared decision making, patient satisfaction, and functional outcomes in patients using an AI-enabled decision aid. These findings suggest that AI-enabled decision aids incorporating PRO measurement data provide a personalized, data-driven approach to shared decision making for the surgical management of knee osteoarthritis.

Treatment and Followup Care Associated With Patient-Scheduled Primary Care Telemedicine and In-Person Visits in a Large Integrated Health System

In the article, [Dr. Mary Reed](#) examines if rates of treatment or followup office or emergency visits differ in patient-scheduled primary care video or telephone visits compared with in-person visits. In the cohort study of more than 1 million patients, adjusted rates of prescribing and nonmedication orders were significantly lower for telemedicine visits than for clinic visits, with slightly higher rates of followup office visits after telemedicine visits but no significant difference in rates of 7-day emergency visits or hospitalizations. The findings suggest that video or telephone visits may offer a convenient way to address some primary care needs within ongoing patient-physician relationships, without substantially higher rates of followup office visits or health events ED visits or hospitalizations.

AHRQ Digital Healthcare
Research Publications Database

[Check out](#) where AHRQ-funded
research has been published.

Reaching the Research Community Through National Webinars

The DHR program convenes [national webinars](#) to highlight recent developments and disseminate the impact of innovative DHR. These conferences allow DHR-funded researchers to showcase and explain their work to a broad and interested audience from around the world.

The July 1, 2021, webinar, [Opportunities for Digital Healthcare: Lessons Learned From the COVID-19 Pandemic](#), featured the following research:

- Dr. Jerome Osheroﬀ showcased the work of the [ACTS COVID-19 Evidence to Guidance to Action Collaborative](#). He described the challenges and opportunities to improve the evidence to guidance to action to data to evidence Learning Health System cycle with digital healthcare

approaches and tools—especially related to putting rapidly evolving evidence and guidance into practice for novel infectious diseases, using COVID-19 as an example.

- [Dr. Alexander Krist](#) described a model for engaging patients in care planning to facilitate decision making, and discussed facilitators and barriers to implementing patient care planning. This work builds on previously AHRQ-funded research on patient portals, with the current focus on how to make them standards based, and thus able to be more broadly shared.
- [Dr. Robert Rudin](#) presented on how his team updated a mobile application that collects PROs on asthma, developed as part of a previous AHRQ-funded grant, and quickly adapted it to face the needs presented by the pandemic.

The October 19, 2021, webinar, [Clinical Decision Support Efforts That Assist Clinical Cognitive Processes](#), featured the following research:

- [Dr. Zach Hettinger](#) showcased research on how he applied cognitive systems engineering to understand and support complex cognition and work activities in the ED to support clinical decision making and reduce cognitive burden of clinicians. Findings from the research were then used to iteratively develop several tools and prototypes to better support clinicians to carry out their work effectively and safely.
- [Dr. Anping Xie](#) presented on how he used a sociotechnical systems approach and a user-centered design method to guide development of an EHR-embedded CDS tool that draws upon the strengths of analytical and naturalistic decision making. Findings from the study found the use of the tool reduced unnecessary blood culture utilization for infants in the pediatric intensive care unit.
- [Dr. Yalini Senathirajah](#) highlighted her work on developing and testing an application called MedWISER (Medical Widget-based Information Sharing Environment), which uses a distinctive interaction style in which the user can “compose” or assemble desired information together on the same screen. By allowing clinicians to customize the information in the EHR display, the use of MedWISER reduced the cognitive burden on clinicians, saved time, and supported clinical decision making in high-stress situations.

Disseminating Knowledge and Research Findings at Conferences

AHRQ DHR-funded researchers and staff presented research findings at a variety of digital healthcare, health services research, medical, and other conferences. These included the Annual Symposium for the American Medical Informatics Association (AMIA), AcademyHealth’s Annual Research Meeting, the Human Factors and Ergonomics in Health Care Annual Symposium, the American Telemedicine Association Annual Meeting, the Society of Medical Decision Making, and the Health Information Management Systems Society’s Global Conference and Exhibition.

At the 2021 AMIA Annual Symposium alone, AHRQ-funded research was highlighted in seven sessions and demonstrations. Click on the links below in Table 1 to learn more about this research.

Table 1: AHRQ-Funded Research at the 2021 AMIA Annual Research Symposium

AHRQ Principal Investigator	AHRQ-Funded Research Profile	AMIA Session
Steve Bernstein (AHRQ)	ACTS COVID-19 Evidence to Guidance to Action Collaborative	Panel: Using Specific COVID-19 Targets and Patient Care Settings as a Springboard for Driving Global Improvements in the Learning Health System Cycle for COVID-19 and Beyond
Kensaku Kawamoto, David Dorr, Saira Haque, Laura Marcial, Roland Gamache (AHRQ)	Scalable Decision Support and Shared Decision Making for Lung Cancer Screening Translating Hypertension Guidelines into Practice: Development of Interoperable Clinical Decision Support Implementation of an Electronic Care Plan for People with Multiple Chronic Conditions Clinical Decision Support for Pain Management	Panel: Stewardship Considerations in the Development and Implementation of Shareable SMART on FHIR Applications: Case Studies on Multiple Chronic Condition Care Planning and Chronic Pain Management
Kathy Mikk (PI), Edwin Lomotan (presenter, AHRQ)	CEPI Evidence Discovery And Retrieval (CEDAR) Project	Distinguished Poster Award Winner! Poster: Building with CEDAR and Making Evidence More FAIR
Chris Moesel (presenter)	Patient-Centered Outcomes Research Clinical Decision Support Prototype Development and Dissemination	Workshop: Open-Source and Interoperable Approaches for Clinical Decision Support
Jerome Osheroff	AHRQ evidence-based Care Transformation Support (ACTS)	Panel: Stakeholder-driven “Art of the Possible” Patient Journeys for COVID-19 and Beyond; Current and Future Steps to Fully Realize this Vision

AHRQ Principal Investigator	AHRQ-Funded Research Profile	AMIA Session
Ida Sim, Danielle Lavalley, Deborah Cohen, Leslie Lenert, Janey Hsiao (AHRQ)	Improving the Management of Multiple Chronic Conditions with mPROVE Developing Design Principles to Integrate Patient-Reported Outcomes (PROs) Into Clinical Practice Through Health Information Technology: Data, User Experience, and Workflow Requirements for PRO Dashboards Integrating Patient-Generated Digital Health Data into Electronic Health Records in Ambulatory Care Settings EHR-based Screening and Intervention for Intimate Partner Violence	Panel: Transforming Healthcare through Patient-Generated Health Data Integration
Yuyang Yang (presenter), Bruce Lambert (PI)	Preventing Wrong-Drug and Wrong-Patient Errors With Indication Alerts in CPOE Systems	Poster: Implementation of Medication Alerts to Reduce Wrong-Drug and Wrong-Patient Errors in CPOE Systems

AHRQ-Funded Research Results Noted as Most Relevant, Interesting, or Innovative of the Year

A special event held during the virtual [2021 AMIA Annual Symposium](#) featured the year's most noteworthy publications. This popular Biomedical and Health Informatics Year in Review session is informed by AMIA's 20 Working Groups. These groups identified papers representing the most influential biomedical and health informatics work published over the past year. Three of the papers presented the results of DHR research.

Consumer and Preventative Health Informatics Working Group

Dr. Anne Turner's paper in the Journal of the American Medical Informatics Association, "[Personal health information management among healthy older adults: varying needs and approaches](#)," received an honorable mention in the Consumer and Preventative Health Informatics group. The paper described the research team's ecological approach to investigate personal health information management (PHIM) needs and practices of older adults in different residential settings. They found that there are five primary PHIM activities that older adults engage in: seeking, tracking, organizing, sharing health information, and emergency planning. The paper outlines the three major themes influencing older adults' practice of PHIM: (1) older adults are most concerned with maintaining health and preventing illness, (2) older adults frequently involve others in PHIM activities, and (3) older adults' approach to PHIM is situational and context-dependent. The key takeaway of the paper is that older adults' approaches to PHIM are dynamic and sensitive to changes in health, social networks, personal habits, motivations, and goals.

Evaluation, People, and Organizational Issues Working Group

Dr. Wanda Pratt's paper, "[Different roles with different goals: designing to support shared situational awareness between patients and clinicians in the hospital](#)," received an honorable mention in the Evaluation, People, and Organization Issues group. The paper describes their research on studying team-based situational awareness from the perspective of patients and their caregivers and how it can help to ensure high-quality care and prevent errors in the complex hospital environment. The key message of the study is that elevating patients and caregivers from passive recipients to equal contributors and members of the healthcare team will improve situational awareness and ensure the best possible outcomes.

Visual Analytics Working Group

The final AHRQ-funded work highlighted during AMIA's Year in Review session was Dr. Robert Rudin's paper, "[User-centered design of a scalable, electronic health record-integrated remote symptom monitoring intervention for patients with asthma and providers in primary care](#)." The paper outlined how Dr. Rudin conducted a user-centered design process involving English- and Spanish-speaking patients and providers to identify user and EHR integration requirements for a scalable remote symptom monitoring intervention for asthma patients and their providers.



Program Background

About the Digital Healthcare Research Program

AHRQ is the lead Federal agency charged with improving the quality and safety of America's healthcare system. AHRQ invests in evidence-generating research and translates research findings into practice to achieve the following goals:

1. Keep patients safe and improve their health.
2. Help health professionals improve healthcare quality.
3. Generate data to track, evaluate, and improve the healthcare system.

AHRQ's DHR program supports these goals by funding and disseminating research evidence about how the evolving digital healthcare ecosystem can best advance the quality, safety, and effectiveness of healthcare for patients and their families. To fulfill its mission, AHRQ's DHR program has invested in research grants and contracts awarded to over 289 distinct institutions in [48 states, the District of Columbia, and Puerto Rico](#).

What We Fund

In 2021, the DHR program supported:

- 104 grants and nine research contracts
 - » At 64 institutions
 - » In 23 states and the District of Columbia
 - » For a total investment of \$158 million across all project years
 - » For a total 2021 investment of \$30 million, including:
 - \$14.4 million in funding from DHR appropriation;
 - \$11 million in funding from the Patient-Centered Outcomes Research Trust Fund; and
 - \$4.6 million in funding from General Health Services Research appropriation.

The DHR program's [funding opportunities](#) are designed to fund research that fills knowledge gaps and leads to improvements in the design of digital healthcare systems. The program accomplishes this through grant and contract mechanisms that support different types of health services research, including:

- Exploratory and developmental research grants that support research in the early and conceptual stages of development.
- Pilot and feasibility studies.
- Randomized controlled trials and other studies of technology effectiveness.
- Secondary analyses of existing data.
- Scaling and disseminating evidence-based research.

AHRQ also invests in the next generation of researchers by funding promising new investigators through awards intended to foster their career development in digital healthcare research.

Recent priority funding from the DHR program has focused on the following focus areas to add to the evidence base of what and how digital healthcare works best for clinicians, patients and their families, and the healthcare system as a whole:

- Testing how digital healthcare interventions can improve quality of care and healthcare service delivery [at the point of care](#).
- How the digital healthcare ecosystem can improve patient safety and how components of it can be [safely used and implemented](#).
- Innovative and evidence-based interventions that advance the U.S.'s goal of [achieving equity](#) in the delivery of healthcare services, including reducing disparities in quality of care, patient safety, healthcare utilization and access, and ultimately, health outcomes.

Learn More

Want to know more? Visit our website at <https://digital.ahrq.gov/> to learn more about our team, current funding priorities, funding opportunities, and the findings and impact of the work we fund.

Learn more
about the current
[AHRQ Digital Healthcare
Research Funding Opportunities](#).

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